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SOLAR POWER

The Sun In The Backyard

Companies get eager to harness the power of the sun in India

DHANYA KRISHNAKUMAR

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"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that." — Thomas Alva Edison, in 1931

Folks at the Ministry of New and Renewable Energy (MNRE) are thrilled to bits. The sudden spurt of interest and investments in solar energy after the national semiconductor policy was announced last year is proof of their progress and evangelisation, as they deem it. Under the policy, the Centre agreed to bear 20-25 per cent of the capital expenditure of a semiconductor manufacturing or associated facility during the first 10 years, subject to the condition of a minimum investment of Rs 2,500 crore for semiconductor manufacturing plants and Rs 1,000 crore for ancillary plants, including solar cell fabrication units (fabs).

That was the trigger for many players to rush into the solar photovoltaic (PV) space. With over \$7 billion worth investments in PV units sanctioned in the new Fab City that is coming up in Hyderabad, and close to Rs 600 crore set aside for R&D in this area in the Eleventh Plan, the government's solar programme is finally showing signs of growth.

EXECUTIVE SUMMARY

The national semiconductor policy announced last year has triggered investment in solar photovoltaics

India's solar power reception is about 5,000 trillion kWh per year, which is a thousand times greater than the likely electricity demand by the year 2015

But, according to Amol Kotwal, industry manager for energy & power practice at Frost & Sullivan, South Asia & Middle East, "This sudden investment into solar PV is only to take advantage of the benefits and incentives being offered by the government at this point. At present, the APAC solar PV market is a mere \$3 billion-3.5 billion, hardly 20 per cent of the total global market. India will become a serious player in the space only when we are able to simultaneously create a domestic

market for products based on solar electricity. Until then, we are merely playing the role of a supplier for countries such as the US, Europe and Japan, which are way ahead in their use and application of solar energy.”

Explains K. Subramanya, CEO of Tata BP Solar, “We have been around since 1989 and have seen the industry grow from scratch. All Indians have this tendency for herd behaviour and that’s exactly what we are seeing in the case of solar now. The enthusiasm is all very well, but not many have done their homework and drawn up a long-term sustainability plan.”

The project phase itself takes about two years and only then will we get a clear picture of how much actual installed or generation capacity many of the players really have. “And that will be the acid test. That will determine the serious players,” says Subramanya. India’s theoretical solar power reception just on its land area is about 5,000 trillion kWh per year. The daily average solar energy incident over India varies from 4 to 7 kWh/sq mtr. with about 2,300-3,200 sunshine hours per year, depending on location. This is far more than current total energy consumption. Which, even assuming 10 per cent conversion efficiency for PV modules, will still be a thousand times greater than the likely electricity demand by the year 2015.

Tata BP Solar recently signed an agreement with Calyon Bank (Credit Agricole CIB) and BNP Paribas to raise Rs 3.1 billion to fund its solar cell expansion project from the present installed capacity of 128 MW to 300 MW by 2012. Players such as California-based Signet Solar are also planning three PV manufacturing units in India at an investment of over \$2 billion. Moser Baer is investing close to \$1.5 billion; Titan Energy Systems is planning an investment of \$750 million, Nanotech Silicon India \$2 billion, and Hindustan Semiconductor Manufacturing Corporation \$1 billion.

Reliance Industries has also approached the government with plans to set up a semiconductor wafer fabrication plant and solar PV module unit at a total outlay of over Rs 30,000 crore. Who then are the serious players in the field?

Explains Kotwal of Frost & Sullivan, “Signet Solar will become the largest player in the solar space, if they manage to meet their plan of 300 MW installed capacity by end of 2008. Tata BP Solar, with a total capacity of 200MW, will then be relegated to second place. But Moser Baer is the one player that is investing in the entire value chain of solar. In fact, they have recently acquired a firm in Slovenia that manufactures polysilicon. By 2010-11 they could become a formidable player in this space.”

Silicon Troubles

Photovoltaic refers to the creation of voltage from light.

SPV systems directly convert sunlight into useful electricity. This process is called the photoelectric effect. The energy generator in a PV system is the solar cell, which are essentially thin wafers of silicon. These cells when connected in series and parallel constitute a solar panel. The types of solar panels popularly in use are: a) crystalline silicon cells and b) thin-film cells. Currently, all the PV panels manufactured and sold in India are composed of crystalline silicon cells.

The photovoltaic effect was first recognised in 1839 by French physicist Alexandre-Edmond Becquerel. However, it was not until 1883 that the first solar cell was built, by Charles Fritts, who coated the semiconductor selenium with an extremely thin layer of gold to form the junctions. The modern age of solar power technology arrived in 1954 when Bell Laboratories, experimenting with semiconductors, accidentally found that silicon doped with certain impurities was very sensitive to light.

But even as investments are pouring in for setting up solar PV units, over the past few years the solar photovoltaic market has been facing one of its biggest challenges — a severe shortage of polysilicon, a key component of most solar panels. Explains Tata BP Solar’s Subramanya, “Four years ago we got chips for close to \$26 while now we are shelling out close to \$200. The biggest issue was that nobody planned for the future and invested in capacity building. So the sudden rise in demand has left them scrambling for chips. But our bet still remains silicon.”

Another player betting on silicon is XL Telecom & Energy Ltd, which is planning to invest in a solar PV plant in Hyderabad. According to Dinesh Kumar, their CEO & Managing Director, “We’ve invested over Rs 20 crore in solar. And this year we intend to invest Rs 350 crore.”

Adds Kotwal of Frost & Sullivan, “The demand-supply gap is expected to continue well into next year. But post that we will see supply slowly catching up. But having said that, there is no doubt that polysilicon is the best technology for India, given that it is a tried and tested one, and has a higher rate of efficiency than other technologies, such as thin film.”

According to a recent report by Solarbuzz, world solar cell production reached a consolidated 3,436 MW in 2007, up from 2,204 MW a year earlier. Despite polysilicon production for both solar and semiconductor use rising 30 per cent in 2007, it remained the most capacity constrained part of the PV chain. On the demand side, demand from the semiconductor industry is expected to grow at steady one-digit rates, with demand for solar-grade polysilicon expected to reach over 50 per cent of the total demand for high purity silicon in 2008-2009. As many as 21 new entrants started manufacturing polysilicon during the year. Japanese producers continue to lose ground, only accounting for 26 per cent of global production, while Chinese manufacturers raised their share from 20 per cent in 2006 to 35 per cent in 2007.

Alternative Technologies

Meanwhile, alternative technologies, such as thin film production, more than doubled from 181 MW in 2006 to 400 MW in 2007, accounting for 12 per cent of total PV production. Moser Baer India is the first company to invest about \$1.5 billion in thin-film photovoltaic and has plans to ramp up to 600 MW over the next two years from the existing project capacity of 40 MW. This will be done in partnership with Applied Materials. Explains Ravi Khanna, CEO of Moser Baer Photo Voltaic, "While everyone is latching on to PV now, we are moving to thin film technology. Globally, given the rapid growth of the photovoltaic industry, there is currently a shortage of silicon wafers, a key raw material for the photovoltaic industry. We have implemented a three-pronged model for securing raw material supply through a mix of strategic investments in silicon manufacturing,

SOLAR IN INDIA: PLAYERS, INVESTMENT		
COMPANY	INVESTMENT (\$)	TECHNOLOGY
● Tata BP Solar	73 mn	Solar PV
● Moser Baer	1.5 bn	Thin Film
● Signet Solar	2 bn	Solar PV
● Reliance Industries	7,067 mn	Solar PV
● Videcon	250 mn	Solar PV
● ISMC	1 bn	Solar PV
● Semindia Pvt Ltd	3 bn	Solar PV
● Solar Semi Conductor Pvt Ltd	1,100 mn	Solar PV
● Titan Energy Systems Ltd	750 mn	Solar PV
● Nano Tech Silicon India	2.1 bn	Thin Film
● XL Telecom & Energy Ltd	76.25 mn	Solar PV
● KSK Energy Ventures (P) Ltd	70.25 mn	Solar PV
● Embedded IT Solutions (India) Ltd	5 mn	Solar PV
● Chandradheep Solar	70.7mn	Solar PV
● Neotech Solutions	40.52 mn	Solar PV
● Photon Energy Systems Ltd	47 mn	Solar PV
● Sorana Ventures	70.7mn	Solar PV
● RamTerra Solar Pvt Ltd	500 mn	Solar PV

long-term wafer supply contracts and spot purchases. Our photovoltaic manufacturing capacities for crystalline silicon and thin film technologies are coming up in Greater Noida and Sriperumbudur."

For Applied Materials, Moser Baer is its first customer for thin film technology in the world. The company has invested significantly to develop the solar portfolio by acquiring two companies — HCT, a wafering systems company in Switzerland, and Baccini, leaders in screen printing technology in Italy. Adds Applied Materials' Shanmugasundram, "The primary obstacle to solar taking off in India is high interest rates. Since solar involves higher upfront capital cost, PV power that would cost around Rs 5 per unit in developed countries can cost up to Rs 7-8 in India. The second is availability of panels. Local manufacturing and capacity build up may be necessary to address this gap."

Apart from the government incentives, what is the one factor that is tempting companies to bet on solar? Analysts say, the demand in developed countries is the primary reason behind this unprecedented interest. Countries such as the US, Germany and Japan are looking at reducing their carbon footprint by resorting to renewable sources of energy, while also building up energy security. Adds Subramanya, "As of now, the total installed capacity in India is about 130 MW, of which almost 105 MW is exported. The domestic market needs to be created and that is the onus of the government and the players in this space."

According to Roth and Rau, a Germany-based solar cell manufacturing solutions provider, India still is not among the world's top 10 solar energy generators. But at the current 20 per cent annual growth, India can emerge as the fourth largest generator of solar energy after Germany, Japan and China in the coming years.

Explains B. Shivalingaiah, former managing director of Karnataka Renewable Energy Development Limited (KREDL), "It's only in the past five years that we have begun to see interest and activities pick up in this sector. Individual states have followed the MNRE mandate and implemented solar PV programmes. In fact, Karnataka has a sizeable market for these products, especially solar water heaters, given that urban people prefer hot water for bathing. Also, we offer rebates on electricity bills to the tune of Rs 250 a month for people using solar water heaters, which also helps promote the usage of these products." Adds Shanmugasundram of Applied Materials, "We believe the market for solar panels can be big in India and can address its power needs. In addition, solar energy can be viewed as a distributed power source, reducing wheeling costs and cost of infrastructure, as well as reduction in transmission losses."

Bright Future?

But despite the growing exuberance and interest in solar, India is still years away from seeing maturity. According to players and experts on solar, there is an unmistakable dearth of understanding about the technology and its varied uses. According to Moser Baer's Khanna, "The next 3-5 years are going to be extremely critical for solar power. But by 2011 we will see this industry standing on its own."

The recognition though has to start with government and policies need to be put in place that encourage lower cost technologies and wider adoption to meet the country's energy needs. And unless that is tackled head-on, the intended effect of solar becoming one of the primary sources of energy will remain a distant dream.

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